UAB CENTER FOR INJURY SCIENCES
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209951

December 23, 2002

Docket Management
Room PL-401
400 Seventh Street SW
Washington, DC 20590

RE: Docket No. NHTSA-02-13546-11
Event Data Recorders

This letter is in response to your request for comments. I am writing in support of Dr. Ricardo Martinez's petition to NHTSA for the mandated collection and storage of onboard vehicle crash event data in a standardized and easily retrievable format. Dr. Martinez's request would enhance safety decision making nationally and would be of particular benefit to the State of Alabama. Specifically, a standardized EDR format will facilitate ongoing efforts in Alabama to integrate automatic crash notification (ACN) technology into an organized statewide trauma system. The particular benefits to be expected from NHTSA rulemaking in this area are addressed on the following pages and are organized as responses to the relevant questions in the docket's Discussion of Issues (Section II).

I hope NHTSA will respond favorably to Dr. Martinez's petition and will initiate rulemaking on the use of EDRs. I am happy to offer my participation in any future discussions on this matter.

Sincerely,

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COMMENTS
Docket No. NHTSA-02-13546
Event Data Recorders

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Department of Transportation - National Highway Traffic Safety Administration
Pages 63493 – 63497

II. Discussion of Issues

a. *Safety Benefits*

(1) Safety potential.

We strongly agree with the NHTSA EDR Working Group's conclusion that EDRs have the potential to improve highway safety greatly. Alabama has the fourth highest injury mortality rate in the nation, twice the national average. The rate of fatal motor vehicle collisions, the largest component of all injury events in Alabama, is particularly high relative to the rest of the U.S., as is the rate of morbidity associated with injury. The predominately rural nature of state roads is a contributor to this ranking with prolonged crash notification and response times resulting from motor vehicle collisions in more remote areas. Research has shown that outcomes are dependent upon the time it takes to transport a patient to the most appropriately staffed and equipped facility. By uncovering the injury mechanisms involved in certain crashes it is true that improved safety countermeasures may be developed within vehicles. However, standardized EDR data may also allow investigators to develop algorithms that can predict the likelihood of certain injuries occurring in certain types of crashes. We have demonstrated this with respect to predicting blunt aortic injury, diaphragmatic rupture, and splenic rupture in peer reviewed publications:

> McGwin G., Reiff D.A., Rue L.W. Differences in the incidence and etiology of blunt thoracic aortic injury in motor vehicle collisions by age. *Journal of Trauma.* 2002;52:859-65; discussion 865-6.
>
> McGwin G., Metzger J., Moran S.G., Rue L.W. Occupant and collision related risk factors for blunt thoracic aorta injury. *Journal of Trauma.* In press.
>
> Reiff D.A., McGwin G., Metzger J., Doss M., Rue L.W. Identifying injuries and motor vehicle collision characteristics that together are suggestive of diaphragmatic rupture. *Journal of Trauma.* 2002;53:1139-1145.
>
> Reiff DA, McGwin G, Rue LW. Splenic injury in side impact motor vehicle collisions – The effect of occupant restraints. *Journal of Trauma.* 2001;51:340-5.

The automatic transmission of this information to a central communications center immediately following a collision will allow response personnel to make an advance assessment

of the crash scene, dispatch optimal transport (helicopter vs. ground unit) to the exact location, and notify the most appropriate hospital to begin coordinating its resource capabilities and assume medical control. For the purposes of current efforts in Alabama, this is the most significant safety potential of EDRs.

(3) Use of EDR data.

As discussed above, standardized EDR data may be used to develop prediction of injury. This may be done with increasing accuracy by analyzing real-world data from a broad range of collisions over time, as well as by employing commercial software to conduct occupant kinematic modeling.

To accurately simulate the motion of vehicle occupants during real crashes, a three-dimensional description of the accelerations seen by the vehicle is required. This can only be accomplished by one of two methods: (1) through a very extensive crash reconstruction, involving software that provides said accelerations through modeling of the vehicle path contour, vehicle attributes, and collision attributes, or (2) through onboard equipment that records the accelerations in real time in three dimensions over the entire crash sequence. A single-impact crash pulse is usually less than 100 msec. A complex crash involving multiple impacts may last a couple of seconds. The EDR's this Center has had access to record accelerations in the forward direction only, and only for a limited timeframe (150 msec).

A far-more sophisticated "black box" technology will be needed for the ultimate goal of automatic notification of computer-generated injury prediction that is available immediately upon crash to emergency care providers. In addition to the change in velocity at impact (delta-V), a more-detailed description of the crash pulse, the direction of impact, and forces acquired from occupant compartment contacts (such as seatbelt load, steering wheel load, knee bolster forces, etc) are needed to accurately and automatically predict injury type and severity.

(4) Future safety benefits.

The impact of EDRs will only increase over time as more information is collected and formulas are improved upon, allowing for increasingly accurate injury prediction in an ACN system. As Dr. Ricardo Martinez stated in his October 29, 2002, petition for rulemaking, " The degree of societal benefit from EDR's is directly related to the number of vehicles operating with an EDR and the ability to retrieve and utilize these data."

(5) Research databases.

The Center for Injury Sciences at UAB is leading efforts to integrate ACN technology into the Birmingham, Alabama EMS region and then to other EMS regions in the state. The Center also houses the Mercedes-Benz CIREN Center at UAB. Through CIREN activity as well as our center's Epidemiology Unit we have used the CIREN and NASS databases extensively. However, the EDR data elements do not show up explicitly in NASS or CIREN. These databases and the interpretive output would be enhanced with EDR data elements. Also, it is not

clear that investigators have the ability to read all EDRs. More cooperation on the part of manufacturers would increase the amount of data available.

(7) Possible new databases.

The true benefit of EDR information would be in conjunction with existing NHTSA databases -- NASS, CIREN, SCI, etc. Outside of augmenting these familiar resources, it is not readily apparent how a separate database would provide additional benefits to motor vehicle safety.

(9) Standardization.

As stated above, The Center for Injury Sciences is leading efforts to integrate ACN technology into the Birmingham EMS region, which contains the state's only organized trauma system. A standardized EDR format and the ability for ready retrieval of data will facilitate these efforts and help speed the acceptance and application of such technology to the rest of the state. Due to its rural composition, Alabama has much to gain from a formal statewide trauma system employing ACN technology. As medical personnel are able to make improved diagnostic and therapeutic decisions in less amount of time, mortality rates and the severity of injury will be significantly affected in a positive manner. Mandated uniformity of crash information will be essential to optimizing the deployment and effective operations of the system. Mandated uniformity will cut across proprietary issues and will increase the number of vehicles on the road with the ability to report a collision and generate usable data, thus maximizing the benefits to be expected from an ACN system.

However, as mentioned in (3) above, more sophisticated EDR data will be needed for the ultimate goal of ACN system injury prediction. In addition to the change in velocity at impact (delta-V), a more-detailed description of the crash pulse, the direction of impact, and forces acquired from occupant compartment contacts (such as seatbelt load, steering wheel load, knee bolster forces, etc) are needed to accurately and automatically predict injury type and severity.

b. Technical Issues

(10) Data elements.

As described above, a more detailed description of the crash accelerations is critical to accurate modeling and injury prediction.

(11) Amount of data.

The answer to this question is specific to the intended use of the data. For reconstructing the full crash sequence, data such as vehicle speed, when brakes were applied, etc, must be taken for at least 5 seconds before collision. Acceleration data that can be used for occupant kinematic modeling should be taken for 200 msec, at 10 msec intervals. For ACN and injury prediction the 200/10 msec collection of acceleration and force data should also suffice. Brake pedal force over

crash time would also be useful for reconstructing occupant interaction during a crash (current EDRs record only whether the brake switch is on or off).

(12) Storage and collection.

Improvements to accessing the EDR units are certainly needed. The current OEM EDRs are secured under one of the front seats and require that the seat be removed in some cases. This can be difficult or impossible, and hazardous, for vehicles that have been in a significant crash. A standard (across manufacturers) and nondestructive method of extracting the EDR data is needed. Of course, in an ACN system the wireless communication of certain data elements, if not all data, is vital.

(14) Survivability.

The balance between easy access by investigators and being "tamper proof" should be a primary consideration in any NHTSA rulemaking on this issue. The units must survive severe crashes, but to some degree survivability has been demonstrated with current EDRs by placing them in strategic locations within the occupant compartment. Once installed in the ideal location, data should be readily accessible.

(15) Effect of EDR technologies on your responses.

This Center has had limited exposure to EDRs through it's CIREN Center activity. In each case, we have found data extraction to be difficult and almost dangerous. Since the acceleration data is unidirectional, it is useless for research modeling purposes. Also, recording vehicle speed, engine speed, brake switch activation, etc, at mere 1-second intervals for an event that often lasts less than two seconds limits its usefulness.

c. Privacy Issues

(16) Privacy.

Data currrently used in crash investigations has to meet certain confidentiality standards. In CIREN investigations the data is sanitized as to occupant and crash scene identifiers, and the collection, analysis, and presentation of case information meets federal human use research guidelines. As acknowledged in the docket, many vehicles on the road are already equipped with some form of EDR capability, so much of the groundwork relative to this issue has been laid. The crash data itself contains no personal identifiers and is only stored in the event of a collision. It is only retrieved with the consent of the occupant. In a similar fashion, ACN data elements are only generated in a crash and they need not contain personal identifiers for the system to operate effectively. As Dr. Martinez mentions in his petition, other forms of crash information (i.e. police reports) contain much more personal information than EDRs. However, as Dr. Martinez also points out, privacy concerns can be addressed by ensuring that the vehicle owner also has ownership of the vehicle information and must consent to its use. This would include permitting the information to be transmitted for ACN purposes in a MAYDAY scenario.

d. Role of NHTSA

(17) Role of NHTSA.

In order to fully capitalize on the potential safety benefits of ACN technology, EDR data must be standardized, easily retrievable, and widely available. For researchers to collect the information needed to perfect an ACN system and to fully realize the positive impact on mortality rates and injury severity, each vehicle on the road should have an on-board EDR capable of recording a consistent set of data elements that can be automatically transmitted to a central communication center in the event of a collision. The only way to assure this uniformity and industry standardization is through a NHTSA mandate and industry oversight.